GLOBAL CLIMATE HIGHLIGHTS

MAJOR CLIMATIC EVENTS AND ANOMALIES AS OF MAY 15, 1993

1. Hawaii:

DRY WEATHER EASES SLIGHTLY.

Up to 60 mm of rain dampened the Big Island and almost 50 mm fell on parts of Kauai, but little or no precipitation was reported elsewhere. Since the dry spell began in early February, a deficit of 138 mm accumulated at Honolulu while shortfalls topped 400 mm on parts of the Big Island [14 weeks].

2. South–Central Alaska:

ABNORMALLY MILD CONDITIONS ABATE IN MOST AREAS.

Weekly departures in scattered areas approached +4°C, but temperatures returned to near normal at most locations [Ended at 5 weeks].

3. West–Central North America:

WET CONDITIONS DIMINISH.

Rainfall totals were generally below 20 mm, providing some relief from the very wet weather of the last two months. Six-week precipitation surpluses, however, still ranged from 50 mm to 150 mm [Ending at 8 weeks].

4. East–Central North America:

DRIER CONDITIONS PREVAIL IN EAST, BUT PLAINS REMAIN WET.

Generally less than 40 mm of rain fell on the northeastern United States and southwestern Canada. Farther west, however, as much as 200 mm drenched the central Plains, exacerbating flooding in Iowa. According to press reports, navigation was halted on the Missouri River between Kansas City and Boonville, MO to prevent boat–wake damage to levees. Six–week precipitation excesses approached 180 mm in parts of Oklahoma [13 weeks].

5. Brazil:

STILL ABNORMALLY DRY.

Little or no precipitation was reported in eastern and central Brazil as unusually dry conditions persisted. Moisture deficits since the beginning of April climbed to 330 mm in parts of eastern Brazil [13 weeks].

6. Central South America:

AREA DRENCHED BY TORRENTIAL RAINS.

Up to 150 mm of rain soaked northern Argentina while as much as 260 mm inundated Uruguay and southeastern Paraguay. According to press reports, resultant flooding caused 400 million dollars (U.S.) in damages to towns and farms [Episodic Event].

7. Northern Europe:

WARM AND DRY WEATHER PERSISTS.

Temperatures were 4°C to 8°C above normal across much of northeastern Europe from Poland to the Urals [5 weeks]. Precipitation remained unusually light, with weekly totals generally below 20 mm [5 weeks].

8. Mediterranean Basin:

STRONG STORMS BUFFET REGION.

Storms dumped up to 70 mm of rain on parts of France, Spain, and Portugal. According to press reports, the wind–driven rains stalled mass transit, flooded low–lying areas, and damaged crops throughout the region. Farther south, the storm claimed at least one life, injured more than one hundred individuals, and damaged buildings in eastern Algeria. Along the eastern Mediterranean coastline, as much as 90 mm of rain inundated Greece, Turkey, Egypt, and Syria. Press reports indicated that traffic was stalled in Port Said, Egypt after five hours of torrential rain while flash floods ravaged eastern and southeastern Turkey. Farther southeast, more heavy rains (30 to 70 mm) soaked much of Saudi Arabia, where abnormally wet conditions have been a sporadic problem since early March [Episodic Events].

9. South–Central Asia:

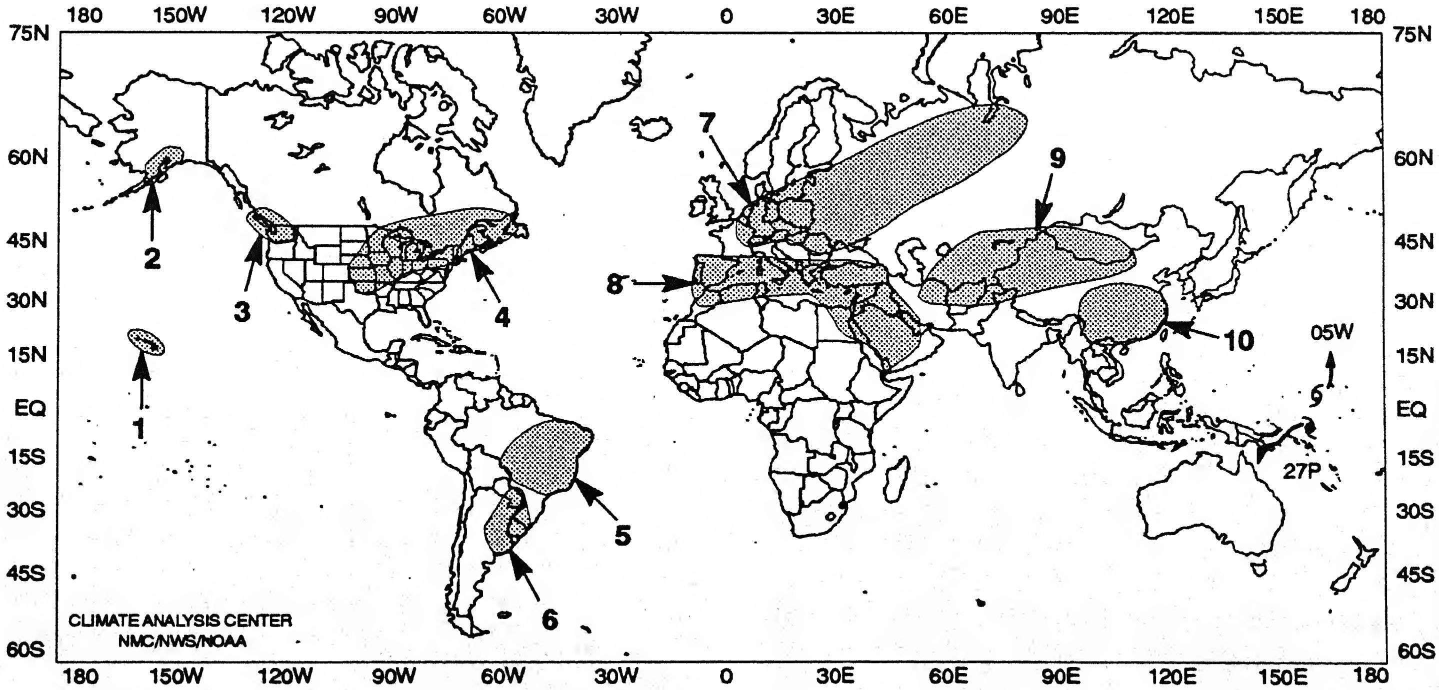
COLD AND WET CONDITIONS PERSIST.

Temperatures averaged 4°C to 6°C below normal while up to 50 mm of rain drenched the region. According to press reports, strong storms claimed at least ten lives in Afghanistan, heavy late–season snows buried portions of Mongolia, and sandstorms resulted in more than forty deaths and over $40 million in crop damage across parts of Mongolia and China [8 weeks].

10. Southeastern China:

ADDITIONAL RAINS CAUSE FLOODING.

Another 80 to 130 mm of rain fell on saturated soils, triggering floods that killed more than a dozen individuals, damaged more than a thousand homes, and destroyed crops, according to press reports [5 weeks].



EXPLANATION

TEXT: Approximate duration of anomalies is in brackets. Precipitation amounts and temperature departures are this week's values.

MAP: Approximate locations of major anomalies and episodic events are shown. See other maps in this Bulletin for current two week temperature anomalies, four week precipitation anomalies, long–term anomalies, and other details.

UNITED STATES WEEKLY CLIMATE HIGHLIGHTS

FOR THE WEEK OF MAY 9 – 15, 1993

Violent weather battered parts of the nation's midsection for the seventh consecutive week as strong thunderstorms spawned tornadoes, large hail, wind gusts up to 70 mph, and heavy rain from southern Texas and the central Gulf Coast northward to the middle Missouri and upper Mississippi Valleys. The week commenced with at least twenty one tornadoes raking Kansas, Oklahoma, and Texas, killing one man and injuring dozens of other individuals. Ten twisters struck an area northeast of Dallas, TX, with heavy damage along Highway 78 through Wylie. According to city officials, 30 homes and businesses were destroyed and a hundred more were damaged. The Southwestern Insurance Information Service estimated damage totals would reach into the tens of millions of dollars. In Oklahoma, rising waters forced the evacuation of 340 homes in Kingfisher, Guthrie, and Skiatook while extensive flooding was reported in Cooke County of north central Texas. The heavy weekend rains also caused widespread flash flooding in Oklahoma, Kansas, and Missouri. A 160–mile stretch of the Missouri River from Kansas City to east of Boonville, MO was closed for fear boat wakes would damage levees. Further north, persistent rain in Iowa caused concern that farmers would be unable to get their crops planted in time to take advantage of the full growing season, according to state agricultural officials. To the east, violent storms killed four people in Maryland, Delaware, and the District of Columbia on Wednesday. The storms, accompanied by wind gusts reaching 65 mph and a few tornadoes, toppled numerous trees and knocked out electrical service for more than 100,000 people.

At the start of the week, a frontal system stretched across the middle of the country, generating showers and thunderstorms that soaked much of the Plains and Mississippi Valley. Powerful storms brought severe weather and heavy rain to Kansas, Oklahoma, and eastern Texas. On Monday and Tuesday, the system stalled over the central Plains and Mississippi Valley, allowing showers and thunderstorms to saturate much of the region. Southerly flow ahead of the system brought warm air into the eastern half of the nation as dozens of daily record high temperatures were broken from the Great Lakes to the northern and middle Atlantic coast. Elsewhere, a Pacific front brought scattered showers to the Northwest and northern California while warm weather settled over the Intermountain West and Rockies.

At mid–week, showers and thunderstorms continued in the central Plains and middle and lower Mississippi Valley as the storm system gradually dissipated. Meanwhile, a cold front raced southeastward out of Canada through the Great Lakes, upper Mississippi Valley, and northern Plains. Showers and severe thunderstorms developed in the warm moist air south of the system, bringing rain to the Ohio Valley, mid–Atlantic, and Southeast. By the weekend, the front moved out into the Atlantic Ocean as another Canadian cold front crossed the Great Lakes, the Ohio and middle Mississippi Valleys, and the central Plains, generating scattered showers. Abnormally warm conditions continued to prevail through the northwestern quarter of the nation where a number of daily record high temperatures were established in Montana on Thursday.

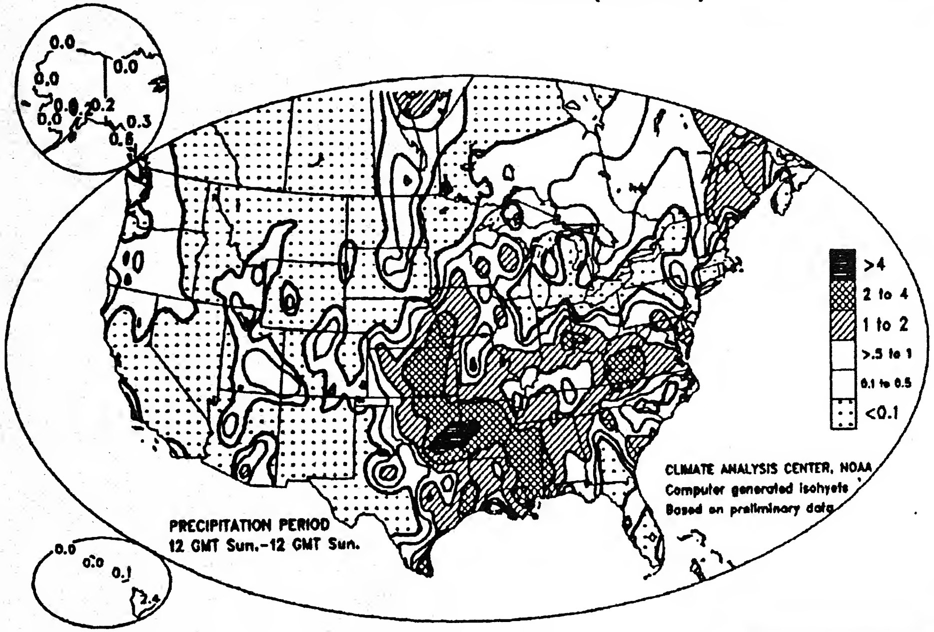
According to the River Forecast Centers, the largest weekly totals (more than two inches) fell from the Red River Valley of Oklahoma and Texas northward to the middle Missouri Valley, and across the lower Mississippi Valley and central Appalachians. Amounts over two inches were also scattered in the Southeast, the mid–Atlantic, the Ohio and middle Mississippi Valleys, eastern Texas, the Cascades, southern Alaska, and the Big Island of Hawaii. Light to moderate amounts were measured in the central Rockies, southern Intermountain West, and across the remainders of the Pacific Northwest, the Great Plains, southern Alaska, Hawaii, and the eastern half of the nation. Little or no precipitation was observed in the northern and southern Rockies, the Great Basin, California, and remainder of Alaska.

Unseasonably warm conditions dominated the West, northern Plains, Midwest, mid–Atlantic, and Northeast. Departures of greater than +6°F were recorded in the Intermountain West, northern Rockies, northern High Plains, Midwest, Northeast, and mid–Atlantic, with departures reaching +16°F in Montana. In Alaska, above normal temperatures again covered much of the state, with weekly departures approaching +8°F at Annette Island.

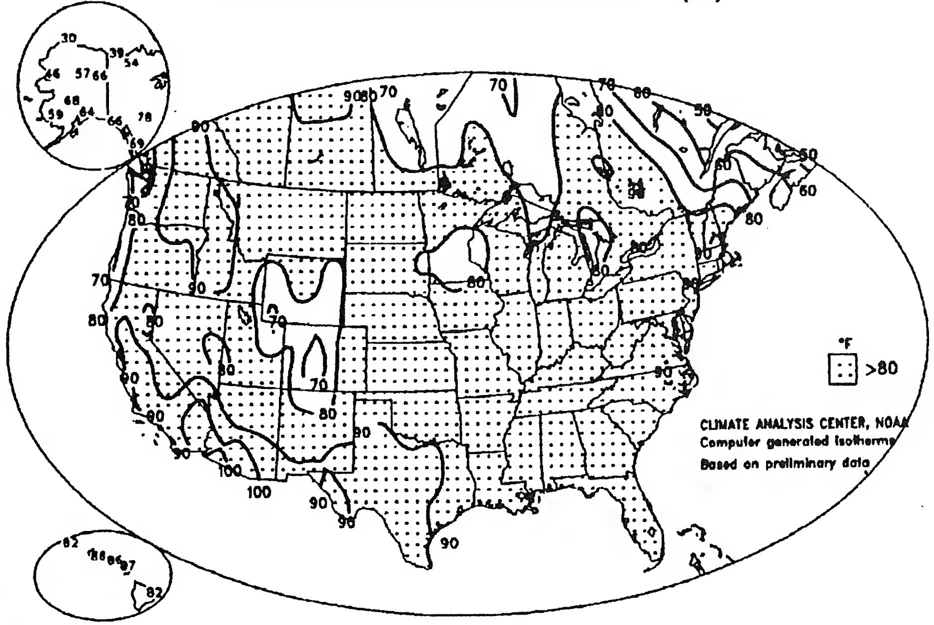
In contrast, relatively cool air prevailed over the southern and central Plains, the lower Mississippi Valley, and southern portions of the Southeast. Temperatures averaged between 4°F and 7°F below normal in western Texas, Oklahoma, and southern Kansas. In Hawaii, temperatures averaged near to slightly below normal.

UNITED STATES WEEKLY CLIMATE CONDITIONS *(May 9 – 15, 1993)*

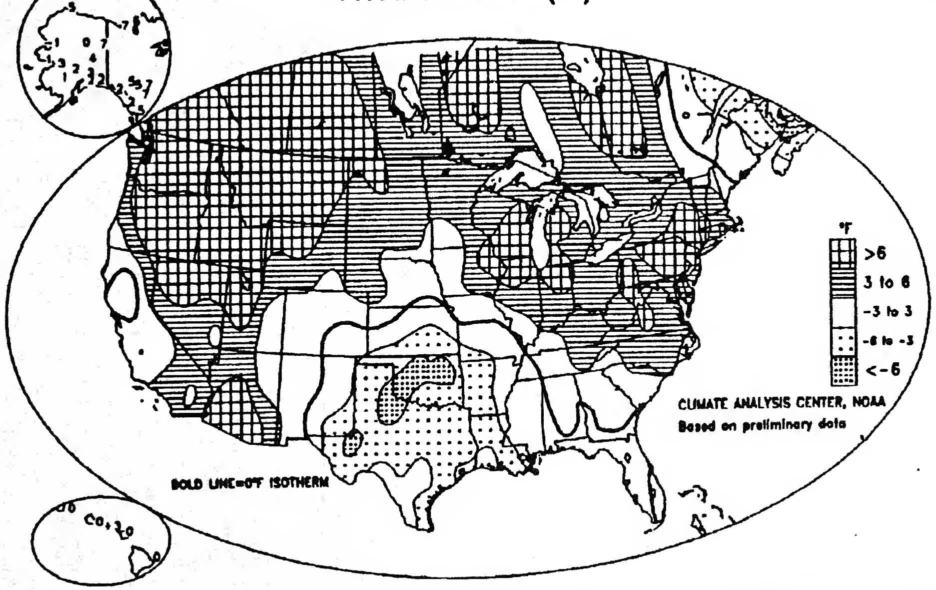
OBSERVED PRECIPITATION (INCHES)



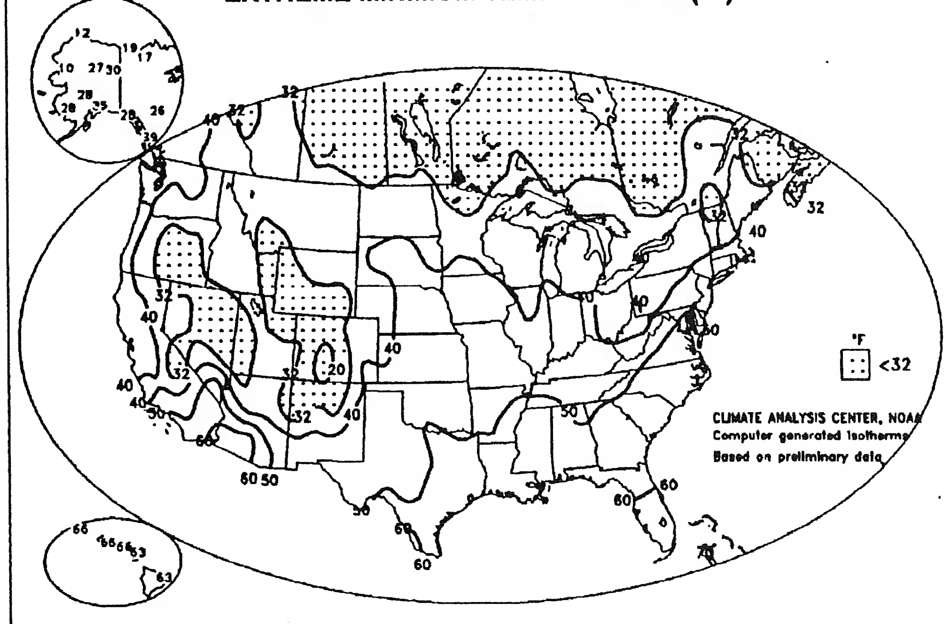
EXTREME MAXIMUM TEMPERATURE (°F)



DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F)

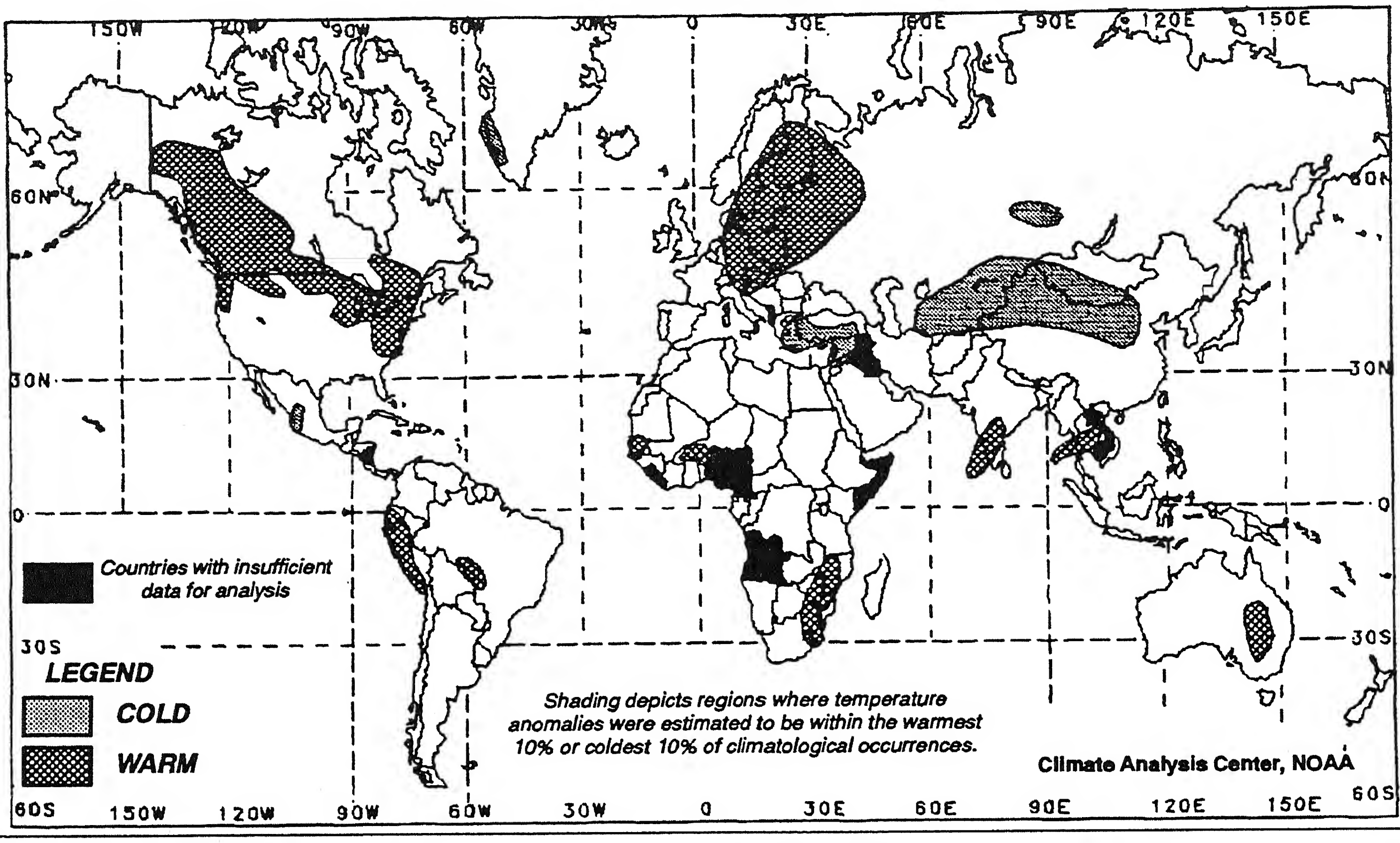


EXTREME MINIMUM TEMPERATURE (°F)



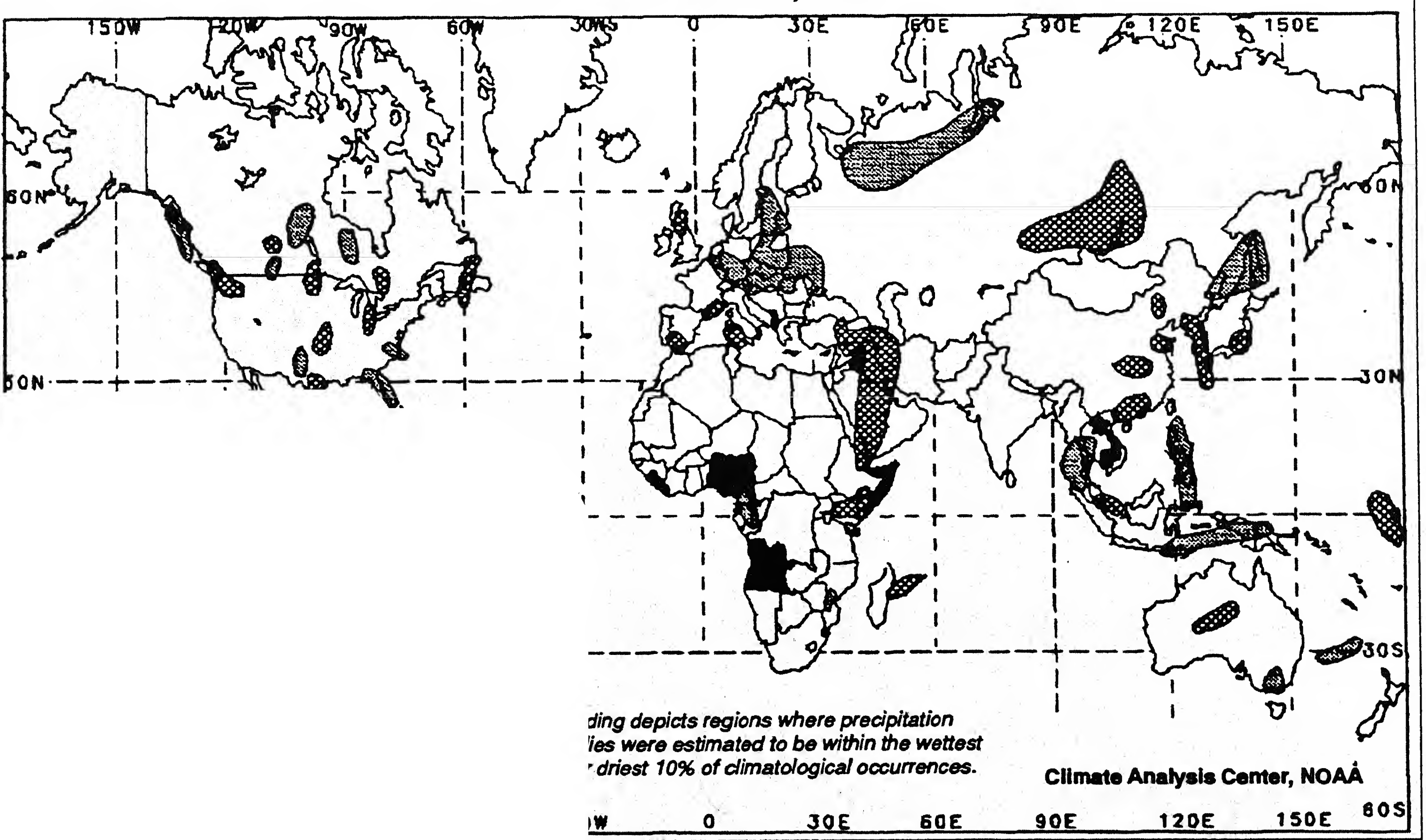
TWO–WEEK GLOBAL TEMPERATURE ANOMALIES

MAY 2 – 15, 1993



FOUR–WEEK GLOBAL PRECIPITATION ANOMALIES

APRIL 18 – MAY 15, 1993



SPECIAL CLIMATE SUMMARY

Climate Analysis Center, NMC
National Weather Service, NOAA

SUMMARY OF THE 1992–1993 SOUTHERN HEMISPHERE RAINY SEASON

The rainy season typically commences during the spring months (September – November), reaches a maximum during summertime (December – February), and gradually diminishes during autumn (March – May) across portions of the Southern Hemisphere, particularly northern and eastern Australia, east–central South America, and southern Africa. The spring/summer maximum was depicted in the Weekly Climate Bulletin #90/48 (dated 12/1/90) on pages 10 – 12. A large majority of the aforementioned areas normally receive over 75% of their annual precipitation during October – April, with parts of extreme northern Australia, south–central Brazil and northern Argentina, and much of south–central Africa typically recording over 90% of the mean yearly total during the seven–month period. As a result, adequate and timely rainfall is necessary during this period for agricultural and hydrological interests since significant precipitation is rare after mid–May.

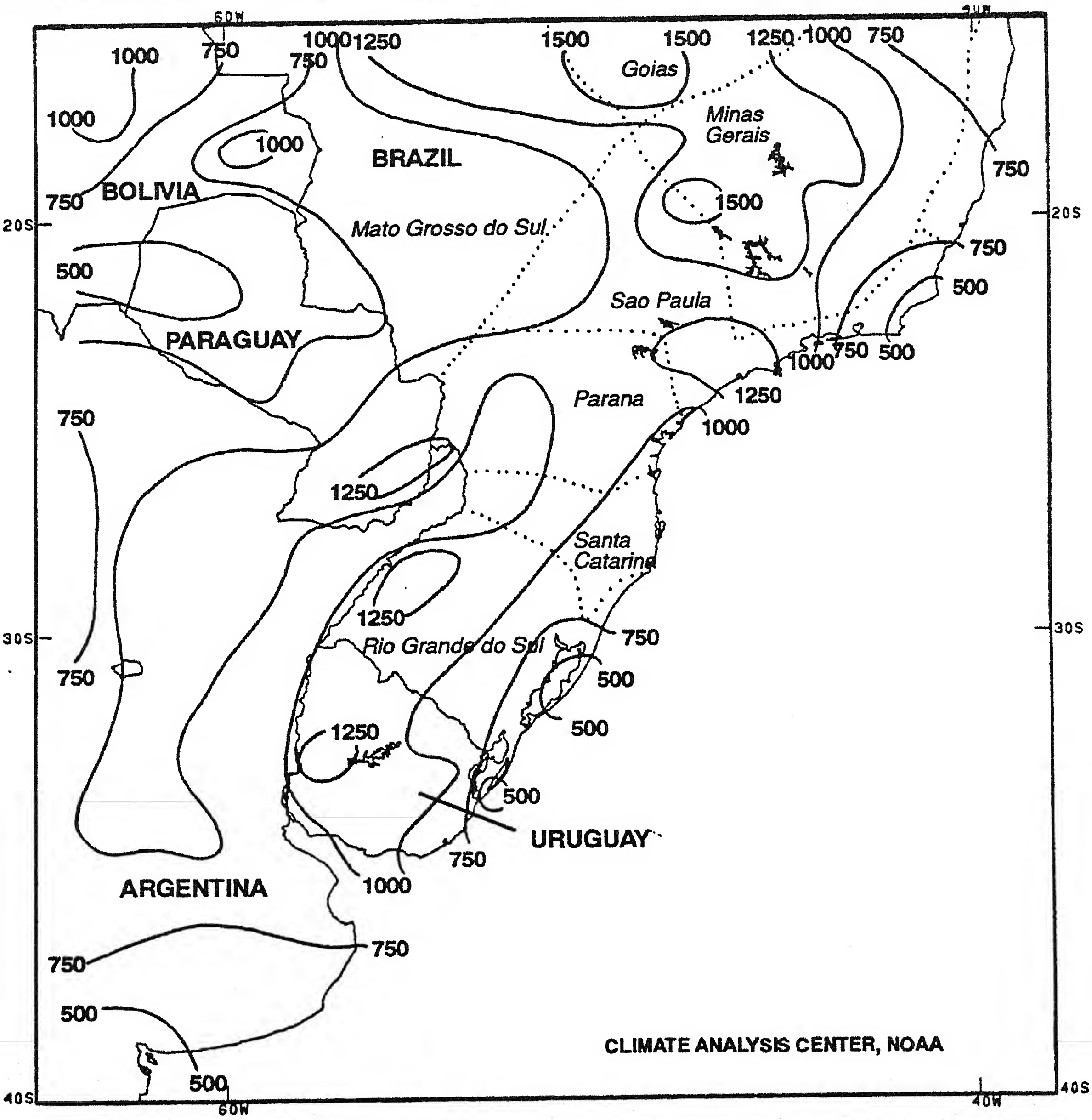


FIGURE 1. Total Precipitation (mm) during October 1, 1992 – May 15, 1993 [228 days]. Isopleths drawn for 500, 750, 1000, 1250, and 1500 mm. *As usual, over 500 mm of rain fell on most of east–central South America, with totals of 1250 – 1520 mm inundating southeastern Paraguay, west–central Uruguay, western Rio Grande do Sul, eastern Sao Paul, western Minas Gerais, most of Goias, and northern Mato Grosso do Sul.*

Through January 2, 1993, above normal rainfall had been observed through large sections of northern Argentina, Bolivia, central Uruguay, eastern Sao Paulo, all but the southern tier of Minas Gerais, and eastern Goias in east-central South America. Subnormal totals had been measured in western Rio Grande do Sul and adjacent Argentina as well as from eastern Santa Catarina northwestward across Mato Grosso do Sul, but widespread and severe moisture deficits were not a problem through the region. In southern Africa, under 50% of normal amounts had accumulated through January 2 across much of Namibia, central South Africa, and portions of eastern Mozambique. Fortunately, the agriculturally–critical areas of northeastern South Africa, most of Zimbabwe, and eastern Botswana had received ample moisture in the wake of the previous wet season's severe drought. Farther east, most locations through central and eastern Queensland had been unusually dry through the first 94 days of the wet season, but ample to excessive moisture had soaked the Cape York Peninsula, western and central New South Wales, and northern Victoria (for more details on the 1992 – 1993 wet season through January 2, 1993, refer to Weekly Climate Bulletin #93/01, dated 1/6/93).

Across east-central South America, the last 4 1/2 months looked very similar to the first part of the 1992–1993 rainy season and, in fact, to the 1991–1992 rainy season as well (front cover and figure 1). Most locations received copious amounts of rain, although a few pockets of subnormal rainfall were observed. January brought surplus moisture to northwestern and central Argentina, northern Uruguay, and extreme southeastern Brazil while drier than normal conditions covered northwestern Paraguay, southeastern Bolivia, and the entire northern tier of the region. Rainfall increased across all but extreme southern Brazil in February, but abnormally low precipitation totals were measured through northern and central Argentina, most of Paraguay and Bolivia, and northern Uruguay. Farther south, however, a wet February was observed in southwestern Uruguay and adjacent Argentina. March brought unusually light precipitation to much of the region (except southern Brazil and west–central Argentina), but eastern Argentina and Uruguay reported more heavy rains during April and the first half of May. This 45–day period brought nearly 480 mm of rain to parts of Uruguay (over three times the normal) while up to 465 mm represented more than four times the normal in adjacent Argentina.

In southern Africa, the rainfall that had provided significant relief from the previous wet season's severe drought through early January tapered off somewhat during the last 4 1/2 months (figures 2 and 3). Near to below normal rainfall totals were measured throughout the region in January, with under

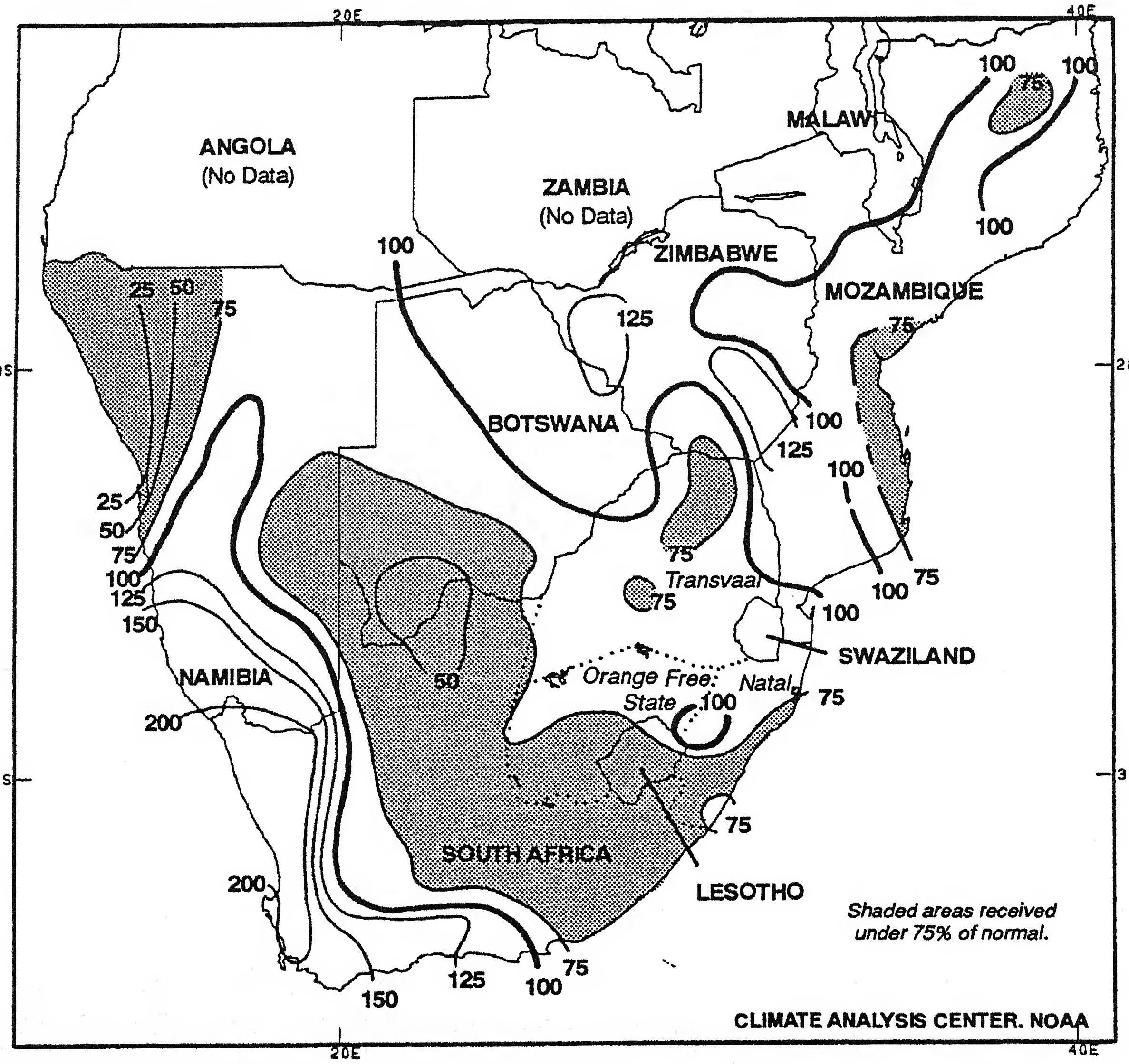


FIGURE 2. Percent of Normal Precipitation during October 1, 1992 – May 15, 1993 [228 days]. Isopleths drawn for 25%, 50%, 75%, 100%, 125%, 150%, and 200%. *Under 25% of normal precipitation fell on northwestern Namibia, where normals are very low. Farther east, only 50% – 75% of normal amounts were measured through much of central and southeastern South Africa, southern Botswana, the northern Transvaal, and portions of northern and eastern Mozambique. In contrast, pockets of above normal rainfall were scattered across northern and eastern sections of southern Africa as well as throughout southern Namibia and western South Africa, where nearly three times the normal seasonal amount was recorded at a few locations.*

25% of the monthly normal reported in the western and eastern Transvaal, northern Natal, and eastern Mozambique. Ample rains soaked eastern Zimbabwe and southwestern South Africa in February, but near or below normal totals were recorded through the rest of South Africa. Precipitation typically begins to decline in March, but March 1993 brought exceptionally dry conditions to most of southern Africa, especially southern Zimbabwe, northwestern Mozambique, Malawi, and central and southwestern South Africa. In April, late-season rains soaked southwestern South Africa, northern Botswana, northern Zimbabwe, and northwestern Mozambique, but subnormal amounts were generally recorded elsewhere. The 1992–1993 wet season as a whole was significantly rainier than last season's excessively dry conditions through most of Zimbabwe, Mozambique, central and northern Botswana, and the Transvaal, but significant moisture shortages still accumulated through southern Botswana, central and southeastern South Africa, portions of the Transvaal, and southeastern Mozambique. According to press reports, last year's severe drought-related food shortages are not expected again this year, although problems are anticipated in a few areas, particularly Lesotho and southern Botswana. Fortunately, the most severely dry areas last season, southeastern Zimbabwe and the extreme northeastern Transvaal, received ample amounts of moisture during the 1992 – 1993 wet season.

A second consecutive subnormal rainy season was observed across eastern and central Queensland, but conditions differed markedly from the previous wet season through the rest of eastern Australia. Unusually dry conditions covered northeastern New South Wales, where above normal amounts fell during 1991–1992. Farther west, very wet weather was observed through central and western New South Wales and Victoria where the 1991–1992 wet season contained subnormal rainfall. In addition, the Cape York Peninsula was excessively moist in 1992–1993, but drier than normal during 1991–1992. The last 4 1/2 months were marked by near to above normal precipitation across the Cape York Peninsula, most of New South Wales, Victoria, and Tasmania. In sharp contrast, moisture deficits increased across central and eastern Queensland, where many locations received less than half of normal

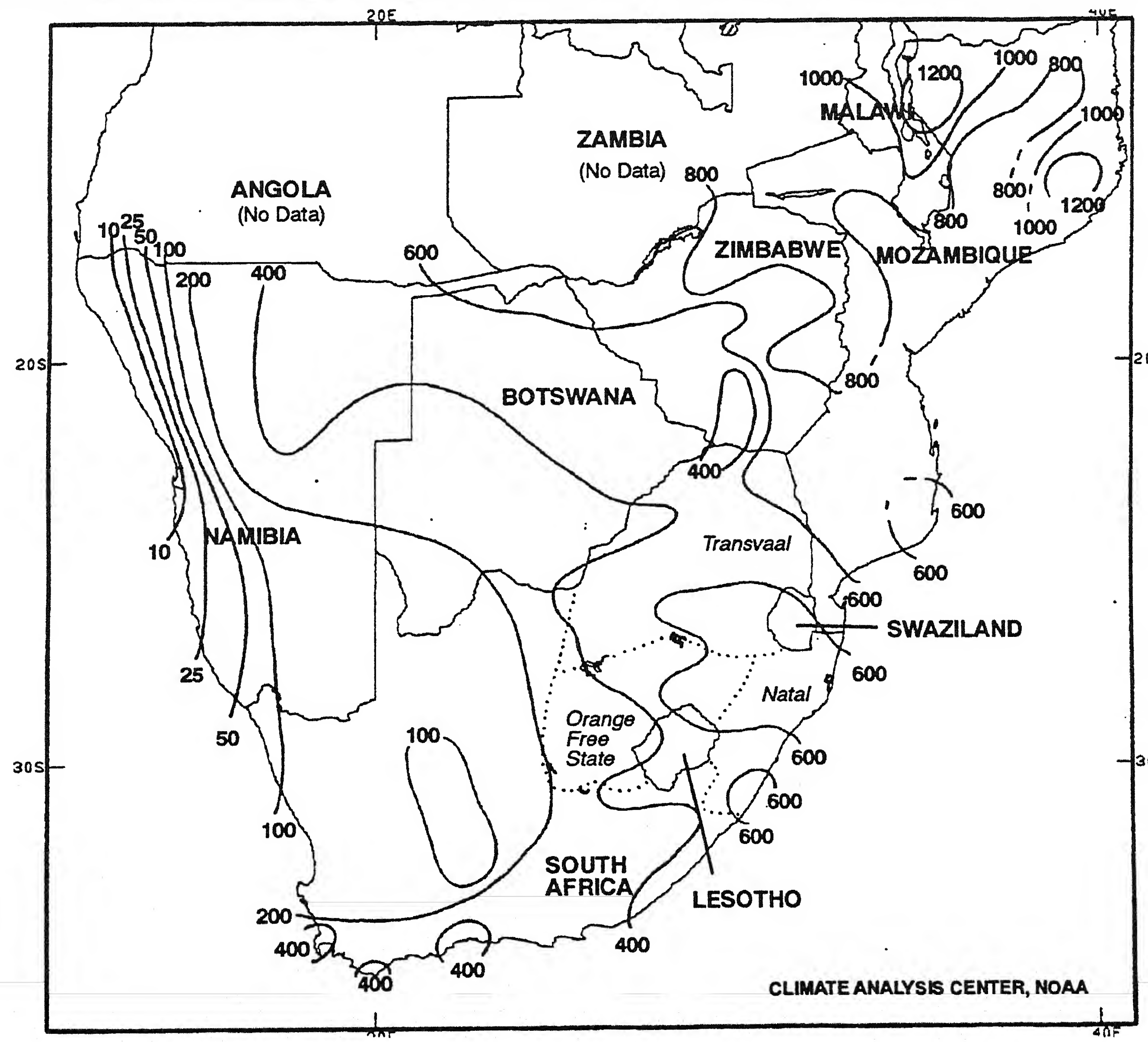


FIGURE 3. Total Precipitation (mm) during October 1, 1992 – May 15, 1993 [228 days]. Isopleths drawn for 10, 25, 50, 100, 200, 400, 600, 800, 1000, and 1200 mm. *As usual, rainfall totals generally increased from west to east across the region. Under 10 mm fell on much of western Namibia while over 1000 mm drenched northern Mozambique and Malawi. Most locations through the remainder of the region received 200 – 800 mm during the period.*

seasonal totals. Most of central and eastern Queensland received less than half of normal rainfall during each of the last four months, and all of eastern Australia reported an exceptionally dry April. January brought above normal rainfall to the southeastern quarter of the continent, but no other significant widespread abnormally moist conditions were reported through the eastern half of the continent from late January through mid–May.

It should be noted that a subnormal rainy season across portions of eastern Australia and southeastern Africa and an unusually wet rainy season through east–central South America all correlate to the anomaly pattern typically observed during the mature phase of low–index (warm) ENSO episodes such as the ongoing one. This correlation was extremely weak during the first half of the wet season, when the ENSO was relatively weak (for instance, abundant rainfall soaked portions of southeastern Africa during the last quarter of 1992, when abnormally dry conditions would be anticipated during a mature low–index episode); however, the anomaly pattern correlation became increasingly strong as 1993 progressed and the ENSO matured (for more information on the current low–index (warm) ENSO episode, refer to the advisory commencing on page 9).

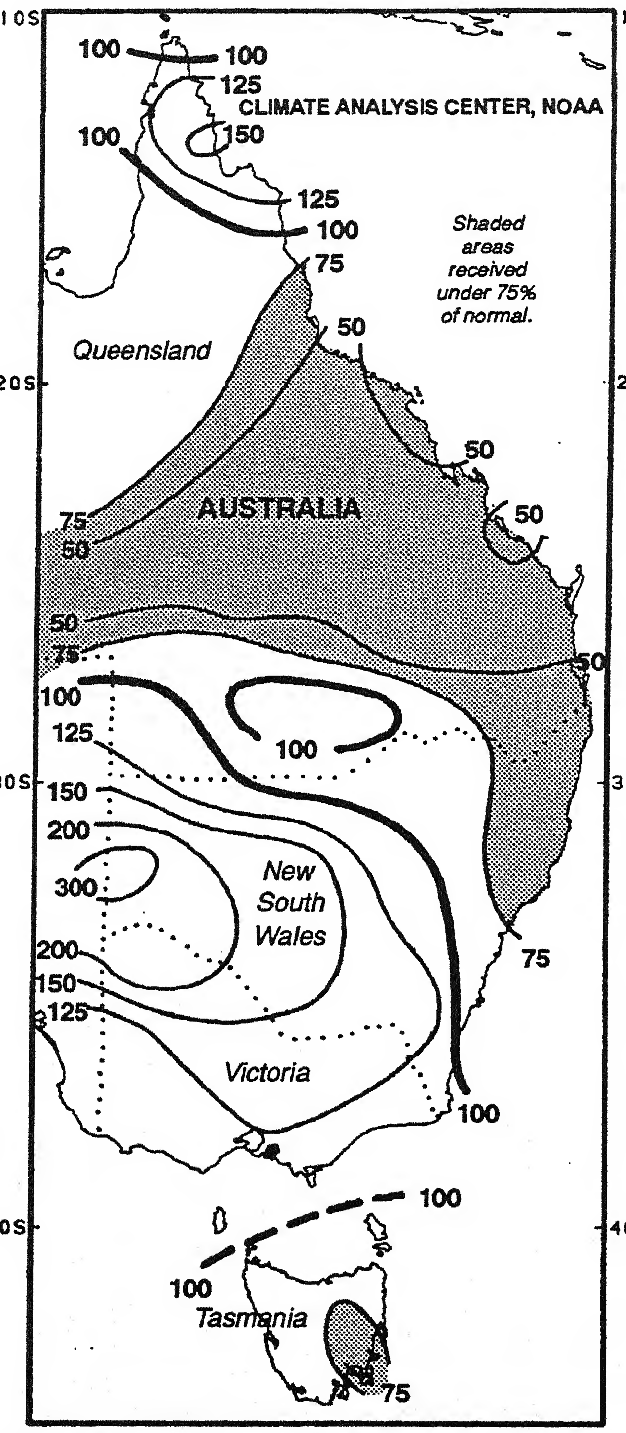


FIGURE 4. Percent of Normal Precipitation during October 1, 1992 – May 15, 1993 [228 days]. Isopleths drawn for 50%, 75%, 100%, 125%, 150%, 200%, and 300%. *Highly variable conditions covered eastern Australia during the 1992–1993 wet season. Abnormally wet weather covered the Cape York Peninsula as well as central and western portions of New South Wales and Victoria. Meanwhile, deficient rainfall was measured across much of Queensland and northeastern New South Wales.*

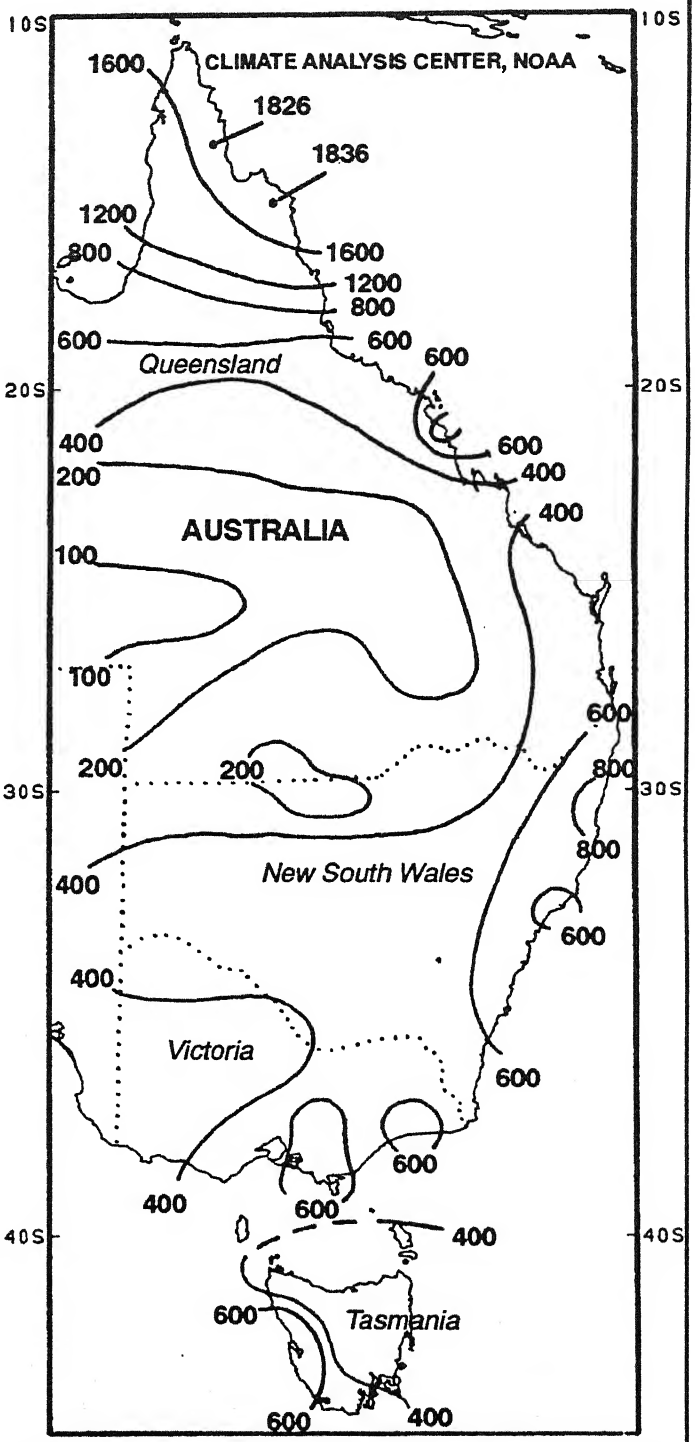


FIGURE 5. Total Precipitation (mm) during October 1, 1992 – May 15, 1993 [228 days]. Isopleths drawn for 100, 200, 400, 600, 800, 1200, and 1600 mm. *Only 50 – 200 mm of rain fell on central and southwestern Queensland while 1200 – 1836 mm deluged parts of the Cape York Peninsula. Seasonal totals generally ranged between 300 mm and 800 mm at most other locations.*

EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC ADVISORY 93/05

ISSUED BY

DIAGNOSTICS BRANCH CLIMATE ANALYSIS CENTER, NMC

May 10, 1993

Warm episode conditions continued in the tropical Pacific during April. The Southern Oscillation Index (SOI) dropped to −1.6, and low-level easterlies remained weaker than normal throughout the equatorial Pacific. Since early 1990 a pattern of negative (positive) sea level pressure anomalies has dominated the eastern (western) tropical Pacific, consistent with a prolonged negative phase of the Southern Oscillation. At the same time, low-level equatorial easterlies have been weaker than normal throughout the Pacific, and tropical convection has been enhanced in the central Pacific.

During April 1993, sea surface temperature (SST) anomalies increased in many sections of the eastern tropical Pacific, continuing a trend that began in January 1993 (Fig. 1). The largest increase in SST anomalies was in Niño3 region (90–150°W) where the average anomaly increased to 1.2°C (Fig. 2). Positive SST anomalies greater than +1°C were observed over many sections of the eastern tropical Pacific (Fig. 3), and also along the west coast of North America. This overall pattern of SST anomalies is quite similar to that observed during April 1992, although the magnitude of the anomalies is somewhat less.

The atmospheric and oceanic evolution in the tropical Pacific during the last three years has no analog during the last 40 years. In the earlier historical record, the periods 1911–1913 and 1939–1941 were characterized by persistent negative values of the SOI. However, it is difficult to make comparisons between current conditions and those observed during these earlier periods, due to the lack of adequate oceanic and atmospheric circulation data.

A coupled ocean/atmosphere model forecast system has been under development at the National Meteorological Center during the last two years. This system will soon be implemented operationally to provide one- and two- season forecasts of oceanic and atmospheric anomaly patterns. Experimental forecasts, using this system, indicate that warmer than normal conditions will continue throughout the central and eastern tropical Pacific through August 1993 (Fig.4).

Given the likelihood that SSTs will continue to be warmer than normal through August 1993 in the tropical central and eastern Pacific, the question arises as to what impacts might be expected. A continuation of enhanced convection and positive SST anomalies in the central equatorial Pacific during the next few months might affect: 1) the evolution of the Southeast Asian monsoon, 2) rainfall over Central America, and 3) rainfall over the Great Basin of the United States. In particular, northern India and Pakistan generally experiences drier than normal conditions during the mature phase of warm episodes. Farther east, positive SST anomalies in the eastern equatorial Pacific result in enhanced convection over the southeast North Pacific, accompanied by a decrease in rainfall over portions of Central America. The warmer than normal SSTs contribute to greater than normal tropical storm activity in the southeastern North Pacific, which may be related to the wetter than normal conditions observed over the Great Basin of the United States during warm episodes.

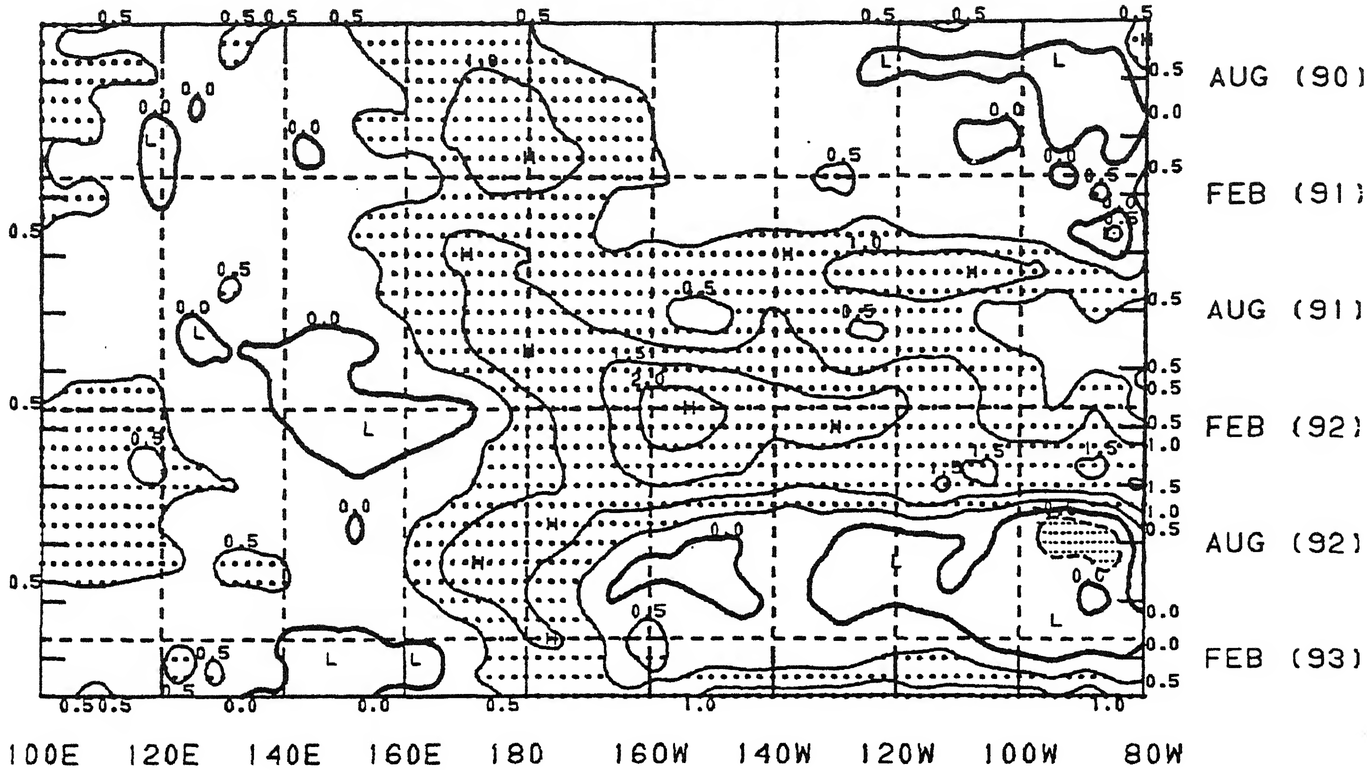


FIGURE 1. Time–longitude section (5°N–5°S) of monthly anomalous sea surface temperature. *Contour interval is 0.5°C. Anomalies greater than 0.5°C are stippled. Anomalies are computed based on the COADS/ICE climatology (Reynolds 1988,* **J. Climate,** *1, 75–86).*

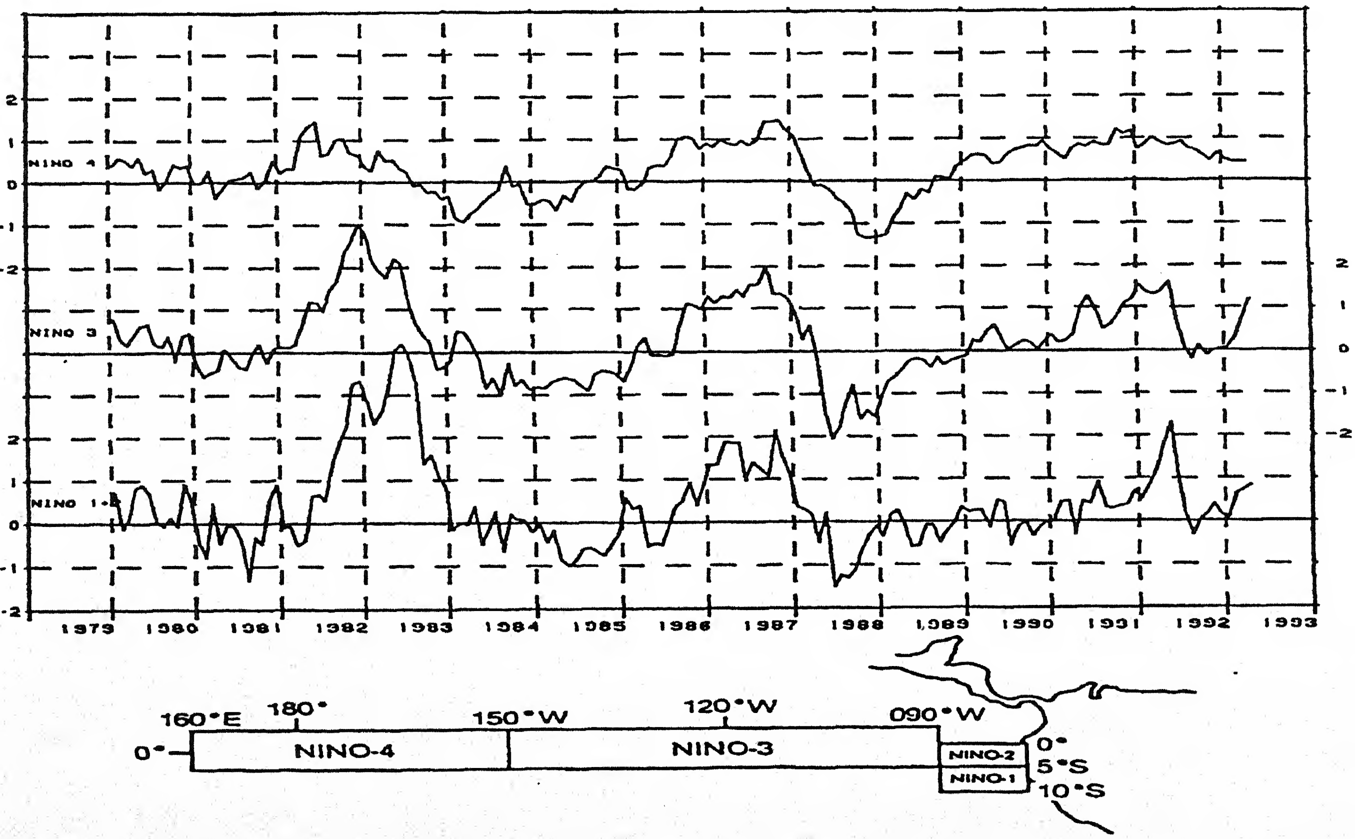


FIGURE 2. Equatorial Pacific sea surface temperature anomaly indices (°C) for the areas indicated in the figure. *Niño 1+2 s the average over the Niño 1 and Niño 2 areas. Anomalies are computed with respect to the COADS/ICE climatology (Reynolds 1988,* **J. Climate,** *1, 75–86).*

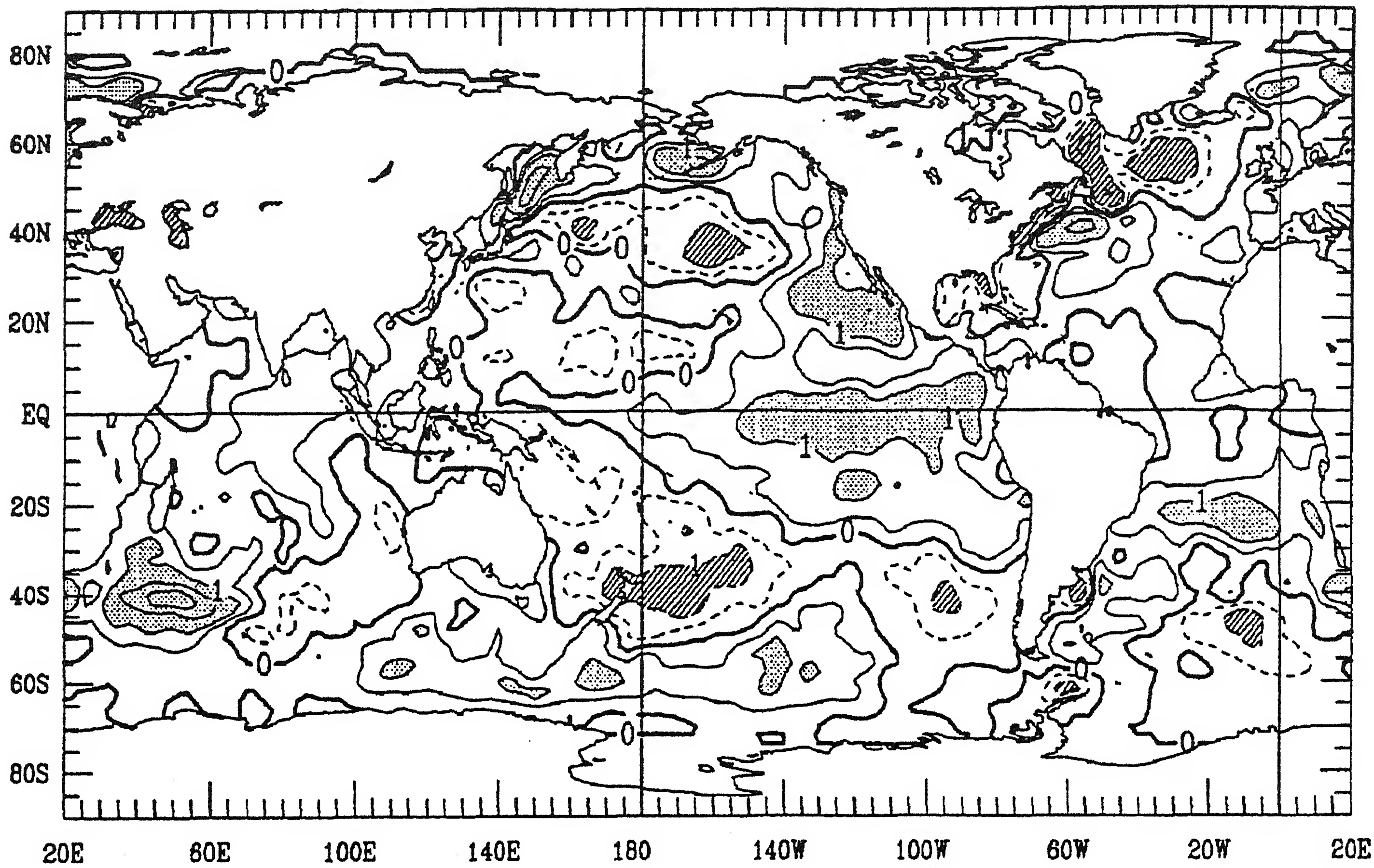


FIGURE 3. Blended sea surface temperature anomaly pattern for April 1993. *The contour interval is 1°C and negative contours are dashed. Additional contours of ±0.5°C are shown. Heavy contours are at 0°C. Light (dark) shading indicates anomalies greater (less) than 1°C (−1°C). Anomalies are computed as departures from the COADS/ICE climatology (Reynolds 1988,* **J. Climate**, *1, 75–86).*

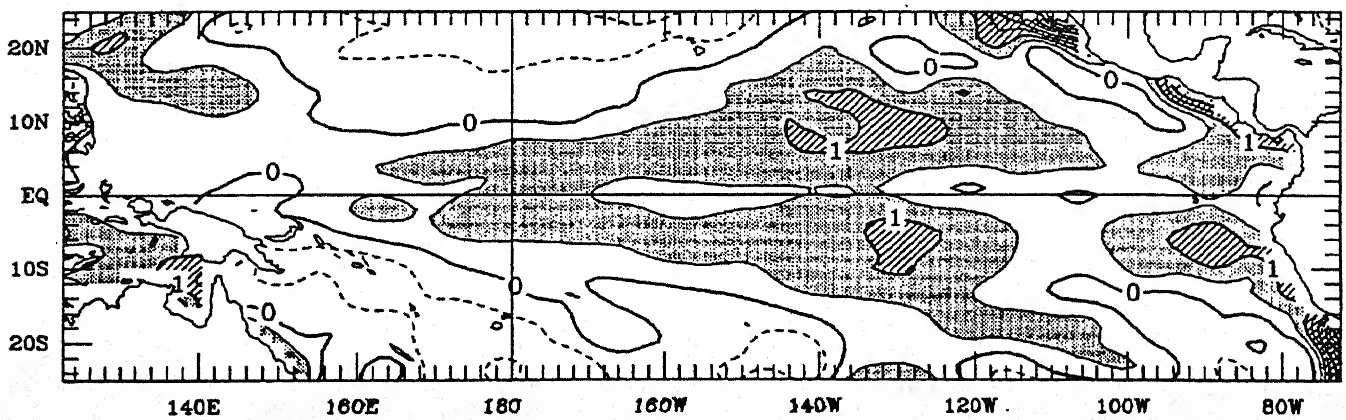


FIGURE 4. Predicted sea surface temperature anomalies for June–August 1993. *Forecast is made using a coupled ocean/atmosphere forecast system developed at the National Meteorological Center. Contour interval is 0.5°C. Negative anomalies are indicated by dashed contours, positive anomalies between 0.5°C and 1°C are shaded, and anomalies greater than 1°C are indicated by cross hatching.*

ATMOSPHERIC AND SEA SURFACE TEMPERATURE INDEX VALUES

DATE	SLP ANOMALIES		TAHITI-DARWIN SOI	PACIFIC 850 MB ZONAL WIND INDICES			PACIFIC 200 MB ZONAL WIND INDEX	OLR INDEX	PACIFIC SST					
	TAHITI	DARWIN		5N-5S 135E-180	5N-5S 175W-140W	5N-5S 135W-120W	5N-5S 165W-110W	5N-5S 160E-160W	NINO 1+2 0-10S 90W-80W		NINO 3 5N-5S 150W-90W		NINO 4 5N-5S 160E-150W	
APR 93	-0.6	2.0	-1.6	-1.7	-1.0	-0.8	-1.0	-2.4	0.8	26.3	1.2	28.5	0.5	28.8
MAR93	0.9	2.7	-1.1	-1.5	-0.4	-0.2	0.0	-0.9	0.7	26.9	0.8	27.6	0.5	28.5
FEB 93	-2.3*	0.0	-1.5*	-1.4	-1.0	-0.5	-1.2	-1.8	0.6	26.3	0.3	26.6	0.4	28.5
JAN 93	-1.3	0.6	-1.2	0.0	-0.9	-1.0	-1.1	-0.7	0.1	24.4	0.1	25.5	0.5	28.6
DEC 92	-1.3	0.0	-0.9	-0.6	-1.2	-0.9	0.0	-1.5	0.1	22.7	0.0	25.1	0.7	28.9
NOV 92	-0.6	0.8	-0.9	-0.7	-1.2	-1.5	-0.4	-0.8	0.4	21.9	0.0	24.9	0.5	28.7
OCT 92	-2.4	0.6	-1.9	-0.1	0.0	0.4	0.8	-0.2	0.2	21.0	-0.1	24.7	0.6	28.9
SEP 92	-0.6	-0.7	0.0	-0.4	-0.9	-1.0	-0.3	0.2	0.1	20.7	0.1	24.9	0.7	28.9
AUG 92	0.2	0.2	0.0	-0.1	0.0	0.0	0.9	-0.1	-0.3	20.6	-0.2	24.8	0.7	29.1
JUL 92	0.7	2.1	-0.8	0.0	-0.9	-0.8	-0.1	-0.2	0.1	21.8	0.1	25.7	0.9	29.4
JUN 92	-1.6	0.2	-1.2	-0.2	-0.7	-0.9	-0.3	-1.0	1.0	23.9	0.7	27.1	0.9	29.4
MAY 92	0.3	0.2	0.0	-0.4	-1.1	-1.1	-0.8	-2.1	2.3	26.4	1.6	28.4	0.8	29.3

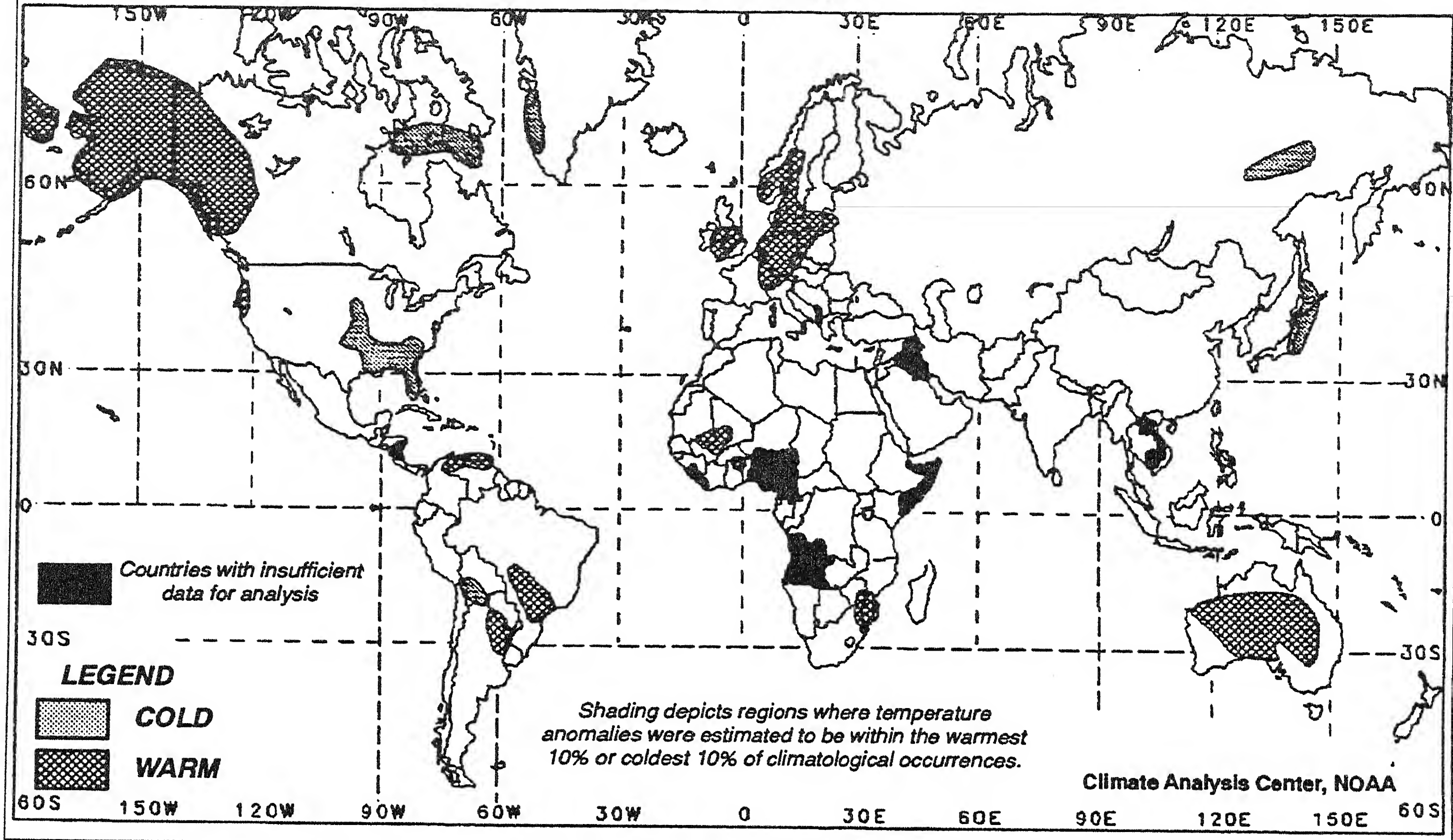
* PRELIMINARY

** REVISED

TABLE T1 – Atmospheric and SST index values for the most recent 12 months. Atmospheric indices are standardized by the mean annual standard deviation except for the Tahiti and Darwin SLP anomalies which are in mb. SST indices (anomalies and means) are in degrees Celsius. Note that positive (negative) values of the 200 mb Zonal Wind Index imply westerly (easterly) anomalies; positive (negative) values of the 850 mb Zonal Wind Indices imply easterly (westerly) anomalies.

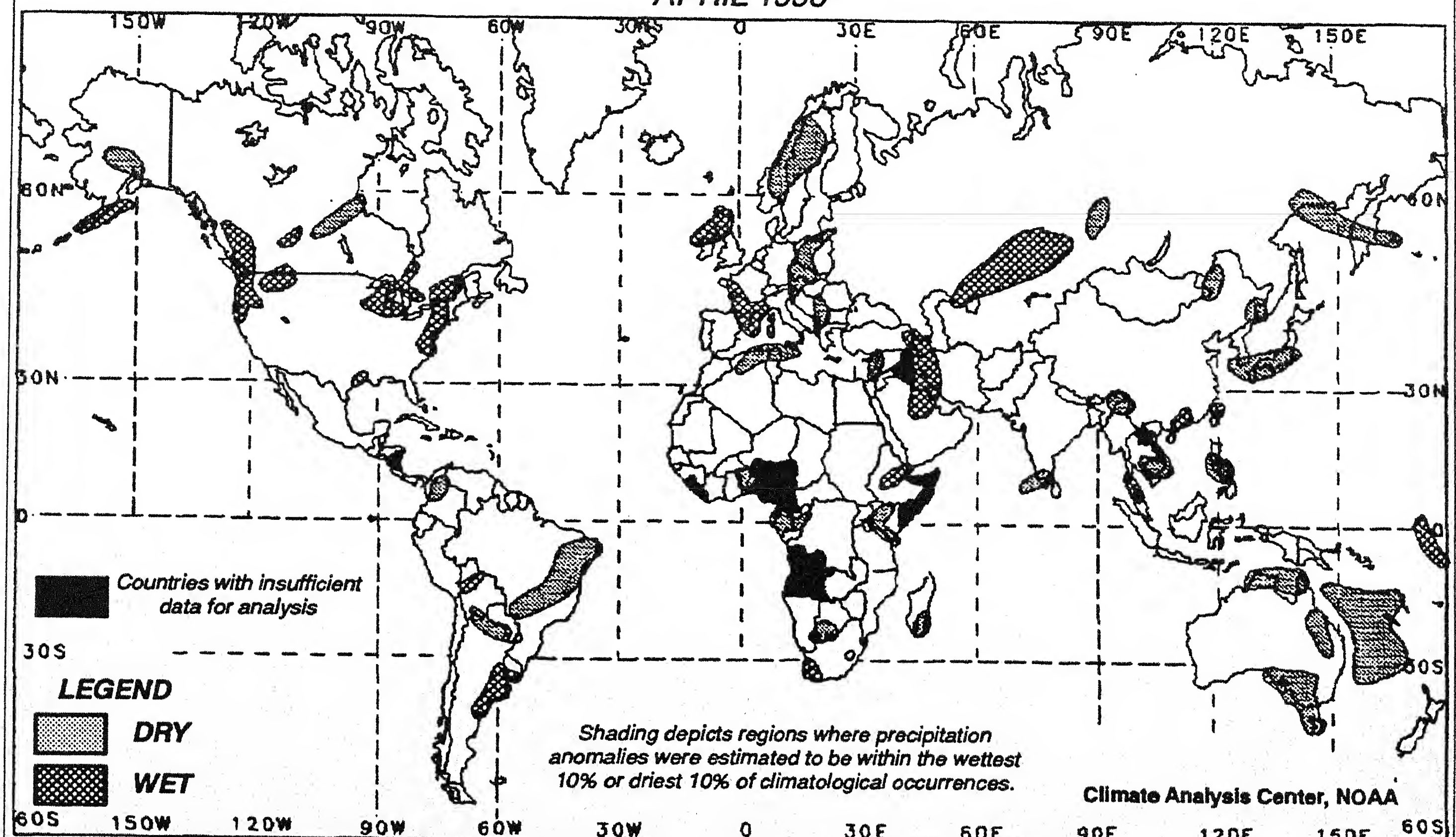
MONTHLY GLOBAL TEMPERATURE ANOMALIES

APRIL 1993



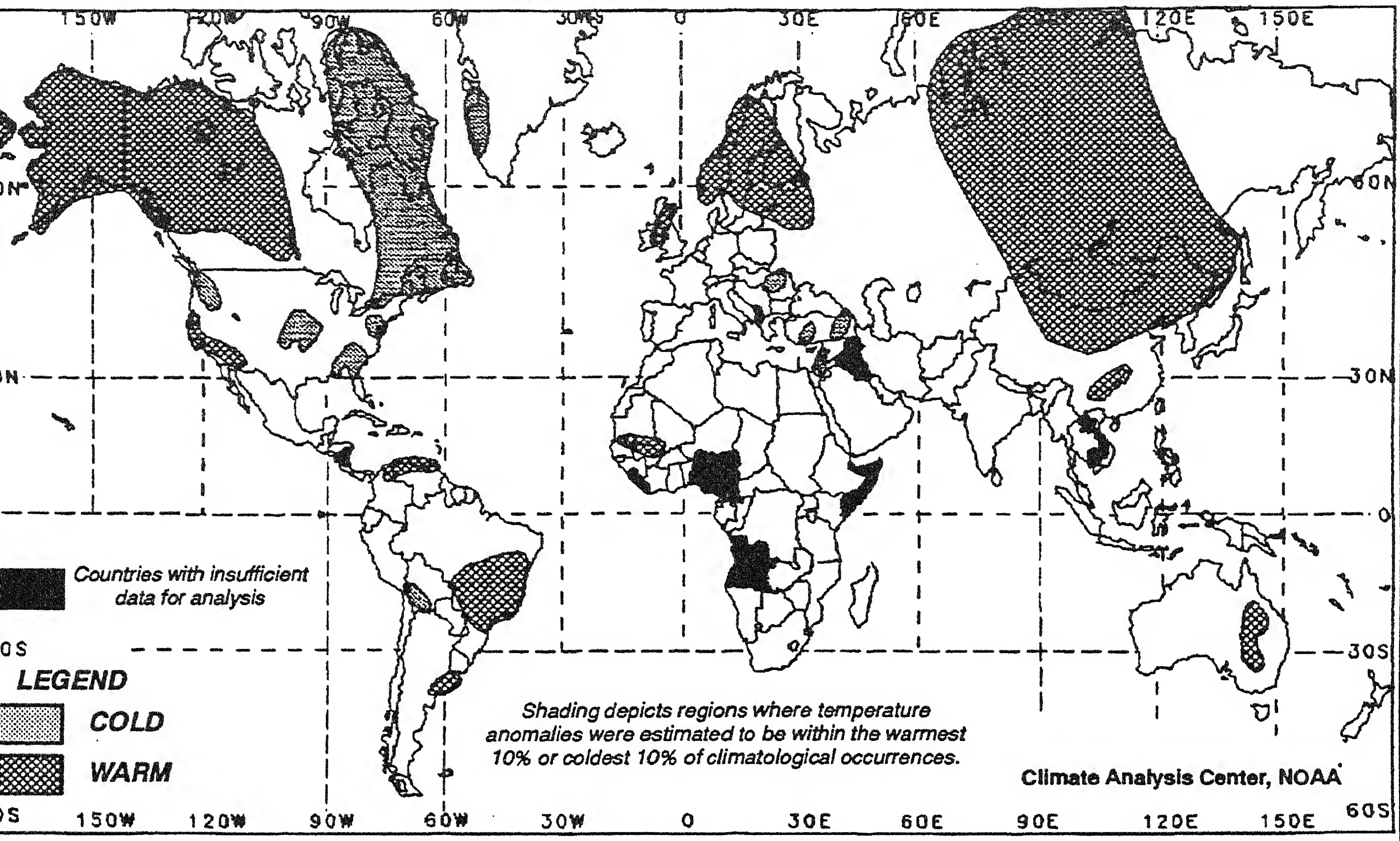
MONTHLY GLOBAL PRECIPITATION ANOMALIES

APRIL 1993



THREE–MONTH GLOBAL TEMPERATURE ANOMALIES

FEBRUARY – APRIL 1993



THREE–MONTH GLOBAL PRECIPITATION ANOMALIES

FEBRUARY – APRIL 1993